ANALYSIS OF LATINX AND AFRICAN AMERICAN RESPONSES TO THE PATIENT HEALTH QUESTIONNAIRE – 9 DEPRESSION SCALE

A Dissertation

by

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ABSTRACT

The PHQ-9 is an inventory that assesses depression and is typically utilized in hospital settings, community settings, and depression related research. The South Texas Brazos Valley Regional Health Status Assessment utilizes the PHQ-9 as part of its assessment. This study investigates the psychometric properties of the PHQ-9 used within the Health Assessment and its African American (n=302), Latinx (n=329), and White (n=2627) participants. The factor structure of the PHQ-9 was identified for the sample utilizing EFA and CFA. The sample was tested for measurement invariance and internal consistency across ethnicity. The item discrimination was identified for African American and Latinx participants in comparison to White participants. Finally, the PHQ-9 endorsement trends were assessed across participants. Contrary to the hypothesis, the three-factor structure model had the best model fit. Additionally, the hypothesis was not met, as a lack of measurement invariance was identified across ethnicity. As hypothesized, and in alignment with previous research, the PHQ-9 has a good level of internal consistency and strong item discrimination across ethnicity. Lastly, based on previous research it was hypothesized that African American and Latinx participants would have higher rates endorsement of somatic items than White participants, however, the somatic symptoms were the most endorsed items for all ethnic groups. In conclusion, the PHQ-9 is a mostly psychometrically sound instrument and it is recommended that it continue to be utilized in the South Texas Brazos Valley Regional Health Status Assessment. Further research is suggested surrounding the measurement invariance and factor structure of the PHQ-9 among future and similar samples.

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CHAPTER I

INTRODUCTION

Studies of mental health issues, such as depression often rely on self-report measures to survey prevalence and incidence. Limited research has explored the reliability and validity of depression self-report measures among ethnic minorities. Depression is a widespread mental health concern, affecting 8.2% of Latinx and 9.2% of African Americans (Brody, Pratt & Hughes, 2018), it is critical to determine that depression inventories accurately assess depression across ethnicity and other variables.

Depression has several negative effects beyond mental and emotional. Depression has been associated with increased rates of diabetes, heart disease, and stroke (Mezuk, Eaton, Golden & Ding, 2008; Nicholson, 2006). According to the Center for Disease Control's most recent National Diabetes Statistics Report in 2014, American Indians/Alaskan Natives have the highest rates of diagnosed diabetes (15.9%) followed by African-Americans (13.2%), and Latinx (12.8%; Center for Disease, 2014). Up to one-third of individuals with diabetes also suffer from depression, and inversely, those with depression have an increased risk of developing diabetes (Lloyd et al., 2010). Research over more than the last twenty years has shown that people with heart disease are more likely to suffer from depression, and those with depression are at a greater risk of developing heart disease (Heart disease and depression, 2017). In the United States, 2.7% of the adult population has had a stroke, amounting to about 7.2 million individuals (Benjamin et al., 2018). According to the American Stroke Association, 2.3% of Latinx adults have had a stroke and 4.1% of African Americans (Benjamin et al., 2018). Among

Latinx adults, risk of depression and depressive symptoms increased for those with one or more of the five risk factors of cardiovascular disease (smoking status, obesity, hypertension, diabetes, and dyslipidemia) (Wassertheil-Smoller et al., 2015). Elevated depressive symptoms have been linked to incidence of strokes among African American and Latinx adults (Glymour et al., 2012; O'Brien et al., 2015). Additionally, because of the high rates of diabetes, stroke, and heart disease among African American and Latinx adults, and the relationship between chronic illness and depression, it is essential to understand the validity of depression inventories when used with these populations.

Given the prevalence of medical conditions that co-occur with depression and that depression is frequently diagnosed in medical settings, it is important to conduct this research with valid diagnostic tools for use in medical settings. The Patient Health Questionnaire - 9 (PHQ-9; Kroenke, Spitzer, & Williams, 2001) is a nine-item self-report measure of depression severity based on the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (DSM-IV) symptoms of depression. Individuals rate each nine items (e.g. "little interest or pleasure in doing things, "feeling down, depressed, or hopeless," "feeling tired or having little energy," etc.) on a Likert scale of "not at all" to "nearly every day." The final question identifies the level of difficulty that the marked problems interfere with their ability "to do [your] work, take care of things at home, or get along with other people." After scoring the PHQ-9, results provide a level of depression ranging from none to severe.

Brossart, Wendel, Elliott, Cook, Castillo, and Burdine (2013) utilized a Regional Health Status Assessment (RHSA) created by the Texas A&M Health Science Center's

Center for Community Health Development (CCHD) to examine the rates of depression among residents in Brazos Valley, a small group of counties in south Texas. Depression was assessed by two self-report measures: the Center for Epidemiologic Studies Depression Scale short version (CESD-5; Shrout & Yager, 1989) and the PHQ-9 (Kroenke et al., 2001). The study found that African American respondents had statistically significant higher CESD-5 and PHQ-9 scores than White and Latinx respondents, regardless of rural residency status. A closer and in-depth analysis of the PHQ-9 among the African American and Latinx sample will further the knowledge and understanding of how the PHQ-9 assesses depression among these groups, and if there are differences in the findings when utilizing different latent variable structures. Identifying psychometric properties of the PHQ-9 among this specific study sample will assist in understanding and appreciating its utility with African-American and Latinx clients.

In this study, the PHQ-9 will be analyzed to determine psychometric properties in relation to ethnic minorities (African American and Latinx) participating in the south Texas Brazos Valley RHSA. The PHQ-9 is typically classified within two latent variables: somatic and non-somatic symptoms. Within this study, Confirmatory Factor Analysis (CFA) will be used to analyze the data and explore latent variable factor structure across ethnicity. Additionally, the reliability and validity of the PHQ-9 will be explored when used with this specific sample, compared to established normative data for the PHQ-9.

CHAPTER II

LITERATURE REVIEW

Depression is a widespread health concern, ranked by the World Health Organization as the fourth leading cause of disability worldwide due to the severity of its symptoms and impact, and the recurrent nature of depressive episodes (Ferrari et al., 2013; Gao, Su, Sweet & Calabrese, 2019; Kessler, 2012; Üstün, Ayuso-Mateos, Chatterji, Mathers & Murray, 2004). The percentage of adults with depression has not significantly changed over time, 8.1% in 2007-2008 to 7.6% in 2015-2016, and 7.1% in 2017, while 4.5% of adults report experiencing a major depressive episode with severe impairment (Brody, Pratt & Hughes, 2018; "Results from the 2017 National Survey," 2017). In 2017, 4.5% of adults in the U.S. reported a major depressive episode with severe impairment (i.e., diminished care for self, suicidality, inability to work, isolation, etc.), approximately 11 million adults (Fried & Neese, 2014; "Results from the 2017 National Survey," 2017). In a 2016 survey, 30% of adults with depression in the U.S. reported moderate to extreme difficulty with work, home, or social activities due to depression symptoms (Brody et al. 2018).

According to the 2010 United States Census report, 50.5 million individuals of Latinx origin lived in the United States, accounting for 16% of the U.S. population (Ennis, Ríos-Vargas, & Albert, 2011). The Latinx population has grown from 35.3 million in 2000 — a 43% increase which accounts for more than half of the total U.S. population (Ennis et al., 2011). As per the 2010 census, Texas has the second largest population of Latinx in the U.S with almost 9.5 million, making up 19% of the total U.S.

Latinx population and 37% of the total Texas population, a 42% increase since the 2000 Census. According to the same 2010 Census data, Blacks or African Americans (individuals self-identifying as Black, having origins in Black racial groups of Africa, or Black in combination with another race/ethnicity) account for almost 14% of the U.S. population, a 15% increase from the 2000 Census (Rastogi, Johnson, Hoeffel & Drewery Jr., 2011). Rastogi and colleagues (2011) note that between the 2000 and 2010 censuses, the African American population increased at a faster rate (15.4%) than the rate observed among the total U.S. population (9.7%). The African American population in Texas increased by 27% between the 2000 Census and the 2010 Census, and accounts for 12.6% of the population in Texas, with 3 million individuals. Texas and the Brazos Valley are targeted areas due to the widespread rural counties that make the Brazos Valley. Rural communities were a focus in the initial study because of the vulnerable and often invisible nature of the population, often under-resourced and understudied. With the continuously increasing number of Latinx and African Americans in Texas, it is important that psychometrically sound instruments are utilized to identify depressive symptoms in a growing population of ethnic minorities.

Prevalence of depression among African Americans and Latinx

In 2004, the National Survey of American Life, studied racial, ethnic and cultural influences on mental health of African American, Afro-Caribbean, and White adults in the U.S. (Jackson et al., 2004). When specifically assessing major depressive disorder across the lifetime, rates were highest for Whites (17.9%), while 12.9% of Afro-Caribbeans and 10.4% of African Americans had been diagnosed in their lifetime

(Williams et al., 2007). The severity of depression was highest among African Americans (56.5%) and Afro-Caribbeans (56%), however both groups sought mental health services and treatment at much lower rates, 45% of African Americans and 24.3% of Afro-Caribbeans (2007). In a study of older adults in the U.S. that utilize Medicaid or Medicare, 16% of African Americans screened positively for depression (Hooker et al., 2018). In a study of long-term nursing home residents in the U.S., 7.4% of African American residents scored a 10 or more on the PHQ-9, indicating significant depressive symptoms and a likely diagnosis of depression (Li et al., 2019). In a longitudinal study of depression among U.S. veterans from 2005 to 2016, the prevalence of depression among African Americans averaged 6.6%, with a range of 4.49% to 10.16% (Liu, Collins, Wang, Xie & Bie, 2019).

In a meta-analysis of the prevalence of depression among Latinx in the United States, researchers examined articles that address ethnic differences in major depressive disorder and depressive symptoms (Mendelson, Rehkopf & Kubzansky, 2008). Of the eight studies that explored the prevalence of lifetime major depressive disorder only, a statistically significant difference across ethnicity was not found (Mendelson et al., 2008). The remaining twenty-three studied ethnic differences and the current prevalence of depression symptoms. Although assessed Latinx adults had higher prevalence of depressive symptoms, the magnitude of difference was small, comparable to a 1-2 point difference on a 60-point scale (Mendelson et al., 2008). In a study of older adults in the U.S. that utilize Medicaid or Medicare, 16-25% screened positively for depression across Latinx ethnic subgroups (Hooker et al., 2018). In a study of long-term nursing

home residents in the U.S., 6.9% of Latinx residents scored a 10 or more on the PHQ-9, indicating significant depressive symptoms and a likely diagnosis of depression (Li et al., 2019). In a longitudinal study of U.S. veterans from 2005-2016, the prevalence of depression among Latinx averaged 7.9% and ranged from 2.2% to 10.89% (Liu et al., 2019).

Symptoms of and influences on depression in ethnic minorities

The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013) indicates depressed mood, anhedonia, difficulty sleeping, feeling tired, change in appetite, feelings of guilt or worthlessness, difficulty concentrating, feeling restless or slowed down and suicidal thoughts as symptoms of major depressive disorder. Although these are the clinical criteria for a diagnosis of depression, different cultural groups may express the symptoms differently and carry judgments about the seriousness of experiencing such symptoms (American Psychiatric Association, 2013). Authors of the DSM-5 caution clinicians to be aware of cultural differences between clinician and patient and how these differences may influence the diagnosis of and or presentation of symptoms of depression (American Psychiatric Association, 2013).

Concepts such as ethnic identity, public regard, private regard, and racial centrality have been utilized to explore relationships and influences on depression (Bynum, Best, Barnes & Burton, 2008; Sellers, Copeland-Linder, Martin & Lewis, 2006; Settles, Navarrete, Pagano, Abdou & Sidanius, 2010). The Multidimensional Model of Racial Identity (Sellers, Smith, Shelton, Rowley & Chavous, 1998) defines public regard

as the way (positive or negative) one feels the ethnic or racial group they belong to is viewed or perceived in society and by others, whereas, private regard is the way one feels and views the ethnic or racial group that they belong to (Sellers et al., 1998). High positive levels of public regard are associated with less depression, as well as positive private regard is associated with less depression (Bynum et al., 2008; Sellers et al., 2006). Racial centrality is the importance placed on race within one's self-concept (Sellers et al., 1998). In a study of African American women, racial centrality is negatively associated with depression, suggesting the higher the level of racial centrality the lower the rate of depression (Settles et al., 2010). Similar to public and private regard and racial centrality, research suggests a high level of ethnic identity is associated with lower levels of depressive symptoms, while low levels of ethnic identity have been associated with high levels of depressive symptoms (Burnett-Zeigler, Lee & Bohnert, 2017; Street, Harris-Britt & Walker-Barnes, 2009; Williams, Chapman, Wong & Turkheimer, 2012).

Cultural experiences and unique depression symptoms among African Americans

In relation to Whites, African Americans diagnosed with depression are more likely to experience severe and prolonged courses of depression, which can result in disease burden and disability; yet they are less likely to report depressive symptoms and seek treatment (Das, Olfson, McCurtis & Weissman, 2006; Williams et al., 2007). In addition to the clinically defined symptoms of depression, African Americans may be at risk for experiencing anger, agitation, "frantic search for social interaction," and somatic symptoms of depression (Alang, 2016). Alang (2016) described other depressive

behavior such as a lack of consideration for others, specifically suicide by cop, in which someone deliberately behaves in a way as to provoke a lethal response from an armed officer. Research regarding suicide by cop is limited, and likely so for a few reasons; the way the deaths are documented or recorded, often a lack of a suicide note which tends to be the evidence needed to make a clear determination of suicide by cop.

Many studies have identified a relationship between perceived racism and/or racial discrimination with depressive symptoms among African Americans, where higher levels of perceived racism/racial discrimination are associated with higher levels of depressive symptoms and can be associated with higher levels of suicide ideation (Carr, Szymanski, Taha, West & Kaslow, 2014; English, Lambert, Evans & Zonderman, 2014; Hammond, 2012; Hankerson, Suite & Bailey, 2015; Kim, 2014; Kogan, Yu, Allen & Brody, 2014; McNeil, Fincham & Beach, 2014; Nadal, Griffin, Wong, Hamit & Rasmus, 2012; Nicolaidis et al., 2010; Odom & Vernon-Feagans, 2010; Walker, Salami, Carter & Flowers, 2014). Measured in a sample of African American mothers in rural communities, women's perception of racism was a significant predictor of depression even when controlling for outside factors (educational attainment, economic strain, employment, etc.), while high levels of optimism and having church-based social support served as protective factors for depression (Odom & Vernon-Feagans, 2010). In a sample of African American men (ages 18 to 68), everyday racial discrimination was associated with more depressive symptoms across all age groups while, among those ages 18 to 39 years and older, increased depressive symptoms were associated with higher levels of restrictive emotional disclosure (Hammond, 2012). Among men aged

18-29 and 40 years and older, self-reliance was associated with fewer depressive symptoms (Hammond, 2012). Research studies show that higher frequencies of racial macroaggressions negatively influence mental health and are significantly correlated with depressive symptoms and negative affect (Carr et al., 2014; Kogan et al., 2014; Nadal et al., 2012). Additionally, marriage can have an influence on perceived racial discrimination and depression; in a study of heterosexual African American couples, a female partner's level of perceived racial discrimination was associated with increased depressive symptoms regardless of spousal support, and a male partner's level of perceived racial discrimination was associated with increased depressive symptoms only among men with low levels of spousal support (McNeil, Fincham, & Beach, 2014).

Environmental factors, such as neighborhood racial composition or living in a rural area, can influence rates of depression in African Americans. A study assessing the relationship between neighborhood racial composition, racial discrimination, and depressive symptoms found that experiencing racial discrimination was positively associated with depressive symptoms (English, Lambert, Evans, & Zonderman, 2014). This study also found that neighborhood racial composition and individual differences in sociodemographics (age, sex, and socioeconomic status) play a role in the experience of racial discrimination and depression in African American adults (English et al., 2014). Men reported a more instances of experienced racial discrimination, while experienced racial discrimination was significantly associated with a higher percentage of White neighbors and increased depressive symptoms (English et al., 2014). Living in a rural area can cause additional stress related to racial discrimination, which has been

consistently linked to greater risk for depressive symptoms and major depressive episodes (Belle & Doucet, 2003; Odom & Vernon-Feagans, 2010)

Cultural experiences and unique depression symptoms among Latinx groups

In addition to clinical symptoms of depression, Latinx communities are likely to express depressive symptoms in the form of somatic complaints, including trembling, chest pains, dizziness, and difficulty breathing (Noël & Whaley, 2012). A more prevalent expression of somatic symptoms within the Latinx community may be attributed to the level of social acceptability of such symptoms and that medical institutions are often sought for treatment instead of mental health clinics (Aguilar-Gaxiola, Kramer, Resendez, & Magaña, 2008). Additional symptoms often experienced by Latinx communities include having little or no emotional control, emotional exploding, inability to cope, excessive worrying and jittery (on-the-edge) feelings; symptoms that would not typically be captured by a depression inventory (Noël & Whaley, 2012).

When screening for and assessing symptoms of depression in Latinx communities, several factors must be considered, including the person's level of acculturation, language acquisition, and citizenship status. Studies suggest that as immigrants from Latinx communities become more acculturated, protective health behaviors and traditions of their culture of origin are often lost while less healthy behaviors from U.S. culture are acquired and can lead to increased rates of depression (Hahn, Kim & Chiriboga, 2011; Hiott, Grzywacz, Arcury & Quandt, 2006; Miranda & Umhoefer, 1998; Rivera, 2007; Stein, Gonzalez & Huq, 2012). Acculturative stress and

discrimination have both been linked to the development of depressive symptoms among Latinx youth and can serve as predictors for greater depressive symptoms longitudinally (Stein et al., 2012). Miranda and Umhoefer assessed depression and three stages of acculturation (low acculturation, bicultural, and high acculturation) among Latinx immigrants in their 1998 study, which found that biculturalism, or integration, is the acculturation stage that is least detrimental to Latinx mental health. Biculturalism, or integration is the preservation of some native culture aspects (i.e., speaking Spanish at home and speaking English when engaging with those in the mainstream culture), and thought to be a healthy balance of cultures (Miranda & Umhoefer, 1998).

In a study of young Latinx adults, a statistically significant relationship between higher levels of acculturation and higher levels of depression was identified (Rivera, 2007). Rivera (2007) further identified family support as a mediating factor between acculturation and depression, where low family support was associated with increased acculturation and increased depression. In addition to acculturation and cultural factors**,** differences in gender can influence the prevalence of depression. In a study of Latinx immigrants, greater social marginalization among men was associated with higher depressive symptoms, while stress related to separation from family was associated with more depressive symptoms among women (Hiott, et al., 2006).

Additionally, ethnic identity, ethnic centrality, public regard, private regard, and perceived discrimination can impact depressive symptoms and the development of depressive symptoms. In a study of primary first-generation Latinx adolescents, high levels of ethnic centrality were associated with fewer depressive symptoms, while both

positive public and private regard were associated with fewer symptoms of depression (Cross, Hoffman, Constante & Rivas-Drake, 2018). In a community based study of Latinx adults throughout the United States, perceived group ethnic/racial discrimination was associated with higher ethnic identity, while higher ethnic identity was associated with lower depression symptoms (Molina et al., 2019). In a study of Latinx immigrant horse workers, perceived workplace ethnic/racial discrimination was associated with depressive symptoms (Negi, Swanberg, Clouser & Harmon-Darrow, 2020).

Language plays a role in the way bilingual people respond to depression inventories. For instance, when responding to an inventory in both Spanish and English, bilingual people tend to give culturally appropriate responses in their native language, and socially desirable responses in their second language (Marin, Triandis, Betancourt & Kashima, 1983; Noël & Whaley, 2012). This discrepancy in response can contribute to errors in a clinician's assessment and judgment of the patient. Despite having means and access to mental health care, Latinx groups are less likely than Whites to receive treatment for depression, and of those that did receive treatment it was at the lowest level of treatment – i.e., inconsistent medication use, inconsistent use of a therapist (Lagomasino, et al., 2005).

Latinx attitudes toward depression can include stigma related to religion, culture, gender norms and culture bound beliefs related to symptoms of depression such as *mal de ojo*, *nervios,* and *ataques de nervios* (Aguilar-Gaxiola et al., 2008; Uebelacker et al., 2012). *Mal de ojo* (evil eye) is a term sometimes utilized to describe a cluster of symptoms such as restless sleep, crying without cause, diarrhea, vomiting, and fever,

thought to be brought on by an adult admiring a child or infant yet not showing physical affection (Aguilar-Gaxiola et al., 2008). *Nervios* is a term sometimes utilized to describe a vulnerability to stress or symptoms such as headaches, irritability, gastric issues, trembling, and dizziness (Aguilar-Gaxiola et al., 2008). *Ataques de nervios* (attacks of nerves) is a term sometimes utilized to describe a reaction to a stressful event, including symptoms such as fear, loss of self-control, uncontrollable shouting, attacks of crying, trembling, fainting, disorientation and dissociative experiences (Aguilar-Gaxiola et al., 2008). Latinx attitudes toward seeking treatment can include a lack of readiness to seek treatment, negative perceptions about taking anti-depressants, stigma, suspicion toward health care providers, language comfortability, confidentiality concerns, self-reliance for healing, fear of discrimination/victimization, and avoidance of discussing issues (Uebelacker et al., 2012). These findings, in addition to cultural attitudes toward depression and varied symptomatic experiences of depression, challenge researchers to continue to question how members of the Latinx community experience depression within their culture, the consistency with which they report depression, and their attitudes toward reporting depression.

Psychometric properties of depression inventories when used with ethnic minorities

Given the social and economic impact of depression on public health, and for the sake of equity in mental health diagnosis, access and treatment, it is essential that inventories and assessments are psychometrically sound across populations (Adams et al., 2019; Contreras et al., 2004; Mellick et al., 2019). Accurate and reliable depression measurement tools are vital for proper diagnosis, treatment planning, and evaluation of

treatment (Titov et al., 2011). The PHQ-9 (Kroenke et al. 2001) requires respondents to rate DSM-IV depression symptoms on a Likert scale. The PHQ-9 is frequently used in primary care settings because of its supportive literature base (Bhatt, Kalogeropoulos, Dunbar, Butler & Georgiopoulou, 2016; Hinz et al., 2016; Huang, Chung, Kroenke, Delucchi & Spitzer, 2006; Janssen et al., 2016; Kroenke et al., 2001; Seo & Park, 2015), its brevity (Titov et al., 2011), and because the items ask about specific criteria for a diagnosis of major depressive episode (American Psychiatric Association, 2000). It should be noted that with the update of the DSM-IV to the DSM-5, criteria for depression is the same, and thus the PHQ-9 is still valid under the DSM-5 (American Psychiatric Association, 2013). Because depressive symptoms are often first reported in primary care settings, having a psychometrically sound tool to screen for depression at that access point is particularly important when working with patients who are otherwise unlikely to seek mental health care. Capitalizing on an opportunity to screen for depression could then lead to earlier detection of depressive symptoms and allow for earlier intervention of those symptoms (Noguera, et al., 2009)

Research regarding the factor structure of the PHQ-9 is mixed, supporting either a one latent variable structure or a two latent variable structure. The one latent variable structure model of depression is unidimensional, meaning all symptoms are under one umbrella of depression (Adams et al., 2019; Krause, Reed & McArdle, 2010; Sunderland, Carragher, Wong & Andrews, 2013). The two latent variable structure model of depression separates the symptoms of depression under two umbrellas – somatic symptoms or non-somatic/psychological symptoms, yet still assessing for

depression (Adams et al., 2019; Krause et al., 2010; Sunderland et al., 2013). In a factor structure study of the PHQ-9 among Latinx and White female college students, the two latent variable structure of the PHQ-9 is supported and did not differ across the two groups (Granillo, 2012). Two additional studies of college students in the U.S. (Keum, Miller & Inkelas, 2018) and Japan (Umegaki & Todo, 2017) support a one-factor structure model across gender and ethnicity. Patel and colleagues (2019) utilized data from the 2005-2016 National Health and Nutrition Examination Survey to assess the factor structure of the PHQ-9 among noninstitutionalized adults. Results support a two-factor structure for the PHQ-9 across sex, race/ethnicity, and education level of the approximately 30,000 respondents (Patel et al., 2019). A study of clinical and non-clinical Japanese adults, support a two-factor structure of the PHQ-9 across clinical and non-clinical groups (Doi, Ito, Takebayashi, Muramatsu & Horikoshi, 2018).

Few studies have identified the reliability, validity, and measurement invariance of the PHQ-9 among African-American and Latinx populations. Merz and colleagues (2011) analyzed the psychometric properties of the English and Spanish versions of the PHQ-9 with a community sample of English- and Spanish-speaking Latinx women. In this study, the PHQ-9 was found to have good internal consistency (English, $\alpha = .84$; Spanish, $\alpha = .85$) and structural validity, also confirming the one latent variable structure model of the PHQ-9. In support of the previous study, Keum and colleagues (2018) validated the one latent variable structure model of the PHQ-9 among ethnically diverse college students, and reported good internal consistency across ethnicity (African American, $\alpha = .90$; Latinx, $\alpha = .86$). In a study of ethnically diverse primary care

patients, the one latent variable structure model of the PHQ-9 was validated across ethnicities and determined to have good internal consistency across ethnicity (African American, $\alpha = .80$; Latinx, $\alpha = .80$) (Huang et al., 2006).

Data about depression measures can be gathered by utilizing factorial invariance analyses, which provide information about the way genders and ethnicities respond to a particular measure, as well as the reliability and validity of such measure (Harris & D'Eon, 2008; Russell, Crockett, Shen & Lee, 2008; Wu et al., 2012). The Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977) is a 20-item self-report depression inventory that assesses depression symptoms experienced within the last week, and follows a four-factor structure model. Russell and colleagues (2008) assessed the factorial invariance of the CES-D among Chinese, Filipino, and European American adolescents. Results indicate that the CES-D followed the four-factor structure model for European American and Filipino American adolescents, yet better fit a three-factor structure model for Chinese American adolescents (Russell et al., 2008). However, in a study by Nguyen and colleagues (2004), the four-factor model of the CES-D was a strong fit for low socioeconomic status African Americans.

The Children's Depression Inventory (CDI; Kovacs, 2003) is a 27-item self-report depression inventory that rates symptoms on a short scale, with a five-factor structure model. A study of African American and European American youth validated the five-factor structure of the CDI (Steele et al., 2006). However, in a study of Native American and Alaskan Native youth, a unidimensional one-factor structure was identified to be a better fit than the five factor structure (Scott, Clapp, Mileviciute &

Mousseau, 2016). Given these study findings, factorial invariance is an appropriate statistical analysis method to use to identify psychometric properties of depression measurement instruments and their utility across cultures.

The Beck Depression Inventory, Second Edition (BDI-II; Beck, Steer & Brown, 1996) is a 21-item self-report inventory of depressive symptoms across a two-week period. Sashidharan and colleagues (2012) used factorial invariance to investigate racial bias in the BDI-II among a sample of African American and White university students and found no evidence of bias in this tool. Mellick and colleagues (2019) validated a two-factor structure model of the BDI-II among African American, Latinx and White adolescents. In an assessment of the consistency of diagnoses of depression from several inventories— the CES-D, BDI-II, Hamilton Rating Scale for Depression (HAM-D; Hamilton, 1960) – in African American and White cancer patients, was approximately 75% consistency across measures for both racial groups (Zhang & Gary, 2013). The study showed that the most disagreements in inventory item analysis occurred in the self-report of depression and sleep disturbance; particularly, African American patients were reluctant to use the word “depression” to describe symptoms, and potentially over reported sleep disturbance (Zhang & Gary, 2013). Zhang and Gary (2013) suggest these findings may be attributed to the difference in utilizing a self-report measure versus an interviewer administered measure, and suggesting if an interviewer is utilized that one is African American and/or culturally competent.

The unique factors that these groups face can influence their levels and incidences of depression. Some research suggests that when assessing depressive

symptoms in African Americans, clinicians should look for somatic and neurovegetative symptoms (appetite disturbance, difficulty concentrating, guilt, loss of interest or pleasure, psychomotor retardation or agitation, sleep disturbance and suicidality) instead of primarily mood or cognitive symptoms, as this group may under report such symptoms due to stigma (Carlat, 1998; Das, Olfson, McCurtis, & Weissman, 2006). When evaluating Latinx groups for depression, clinicians should take language, immigration status, level of acculturation, and wording of inventory questions into consideration as factors that can influence responses (Marin et al., 1983; Miranda & Umhoefer, 1998; Noël & Whaley, 2012; Rivera, 2007; Stein et al., 2012).

Depression is a widespread national and global issue. Studies have explored the varied ways in which ethnicities may experience depression symptoms both typical and not typical of diagnosis criteria. The PHQ-9 is a depression inventory that is widely utilized in both medical settings as well as research studies. The PHQ-9 has shown to be a psychometrically sound instrument across ethnicity, and to at times follow a one- or two-factor structure model. This study aims to contribute to the validation of psychometric properties of the PHQ-9 across ethnicity, specifically among African American and Latinx study participants. Additionally, item endorsement rates will be explored to explore trends in depression symptoms among participants, and potentially unique to African American and Latinx participants.

Research questions and hypotheses

This research will attempt to answer several questions:

1. What is the factor structure (one or two) of the PHQ-9 among African American and Latinx participants?
2. To what degree is the PHQ-9 measurement invariant for ethnicity among African American and Latinx respondents?
3. Is the PHQ-9 item discriminant among African American and Latinx respondents compared to White respondents?
4. What are the differences in responses to the PHQ-9 among the African American and Latinx samples of the CCHD Health Survey?

Hypothesis 1: Consistent with previous research, we expect African American and Latinx responses will support a two-factor structure of the PHQ-9.

Hypothesis 2: Aligned with previous research and psychometric properties of the PHQ-9, measurement invariance will be consistent across ethnicity, reflecting that depression is accurately assessed among African American, Latinx, and White respondents.

Hypothesis 3: Aligned with previous research and validation of the PHQ-9, the PHQ-9 will reflect at least a good level of internal consistency ($\alpha \geq .70$ for all participants - African American, Latinx, and White), and the PHQ-9 will be item discriminant across ethnicity.

Hypothesis 4: Aligned with previous research findings identifying higher rates of somatic symptoms among African American and Latinx populations, African American and Latinx respondents will have higher endorsement of somatic related items in the PHQ-9 than that observed among White respondents.

CHAPTER III

METHODS

Participants

Participants of this study included residents of seven rural counties that comprise the Brazos Valley who received a survey conducted by the Texas A&M University Center for Community Health Development and the Brazos Valley Health Partnership. Approximately 3,400 individuals responded to the Regional Health Status Assessment (RHSA). Respondents identified as White, African American, Latinx, Asian or Pacific Islander, and Native American; however, this study will only use data from individuals that identified as White (n = 2,788), African American (n = 348), and Latinx (n = 366).

The study relies on a secondary data set that was the result of the RHSA conducted by the Center for Community Health Development and the Brazos Valley Health Partnership and its community outreach program.

Procedure

The RHSA was conducted in 2010 as part of a regional seven-county health status assessment. Of the estimated 15,000 household population, residents were randomly selected by address and informed about their selection by mail. The following week, the randomly selected participants received calls about the purpose of the survey. The adult resident with a birthday occurring next was asked to participate. Residents that agreed to participate received the survey packet (English or Spanish depending on participant preference) in the mail with instructions to return the completed survey within a week. The survey took approximately 45 minutes to complete. Of the original

15,000 households, 10,501 were initially reached by phone, 5,362 residents agreed to participate, a total of 3,379 surveys were received, a response rate of 63% However, for the purposes of this study, 3,502 surveys were assessed.

Regional Health Status Assessment

The Regional Health Status Assessment consisted of a variety of self-report questions that asked individuals about their overall health; health habits and medical history; frequency of physical activity; access to health care services; any transportation issues; food and nutritional habits; access to health insurance; utilization of community services; demographics; psychological well-being; and all nine-items from the PHQ-9. The breadth of the survey questions gave researchers insight into the participants' health status, health habits, concerns about their community, and identified issues important to the community within the region.

Measures

Patient Health Questionnaire-9

The Patient Health Questionnaire-9 (PHQ-9) was used in the survey to assess depression among participants. The PHQ-9 is a nine-item self-report measure based on DSM-IV criteria for major depressive disorder (American Psychiatric Association, 2000). Items in the PHQ-9 evaluate the presence of anhedonia, depressed mood, trouble sleeping, feeling tired, a change in appetite, guilt or worthlessness, difficulty concentrating, feeling slowed down or restless, and suicidal thoughts (American Psychiatric Association, 2000). Each item is rated on a Likert scale with scores of 0 (not at all), 1 (several days), 2 (more than half the days), and 3 (nearly every day). A

categorical algorithm is utilized to diagnose depressive disorder. Individuals that endorse 5 or more of the 9 items as “more than half the days,” with one item being depressed mood or anhedonia, recommend a diagnosis of major depressive disorder (Baas et al., 2011).

Reliability and validation studies have determined the PHQ-9 to be a psychometrically sound instrument (Doi et al., 2018; Granillo, 2012; Hinz et al., 2016; Huang et al., 2006; Janssen et al., 2016; Keum et al., 2018; Kroenke, Spitzer, Williams & Löwe, 2010; Merz et al., 2011; Patel et al., 2019; Seo & Park, 2015; Umegaki & Tod, 2017;). Kroenke and colleagues (2010) conducted a systematic review of validation studies of the PHQ-9, in which criterion validity ranged from α = .77 to .94, and internal reliability ranged from α = .86 to .92, indicating that the PHQ-9 performs similarly across age, sex, and ethnicities. In a validation study of the PHQ-9, internal reliability ranged from α =.79-.86 across ethnicities (African American = .80; Chinese American = .79, Latinx = .80, White = .86) (Huang et al., 2006). In a study of diverse college students, internal reliability for the PHQ-9 ranged from α = .86-.93 (Asian American = .93; African American = .90; White = .88; Latinx = .86; Keum et al., 2016).

Data Analysis

The method of data analysis utilized in this study were descriptive statistics and measurement invariance. Using SPSS, descriptive analysis was performed to describe the sample, including characteristics such as mean age, ethnicity, ratio of men to women, average education level, marital status, and employment status. Using AMOS, measurement invariance and factor structure of the PHQ-9 was assessed.

The purpose of item discrimination is to determine if an item in an assessment testes what it is intended to test, ultimately leading to internal consistency. Assessments are expected to have internal consistency, reflecting that all measurement items assess what they are intended to assess across demographics and populations. In this study, the item discrimination of the PHQ-9 was assessed across ethnicity to examine the item functioning among African American, Latinx, and White participants. Internal consistency was determined utilizing reliability analysis and Cronbach's α in SPSS.

The purpose of using measurement invariance was to determine if scoring differences across groups could be attributed to group differences on the latent variable. The purpose of measurement invariance is to test if scoring differences across groups are attributed to group differences on the latent variable. Confirmatory Factor Analysis (CFA) tests both measurement invariance and structural invariance across groups (Merz, Malcarne, Roesch & Riley, 2011). Using AMOS, a multigroup confirmatory factor analysis of each model was assessed to determine if the PHQ-9 is measurement invariant for ethnicity among study participants. In this study, five different one- and two-factor structure models of the PHQ-9 were assessed among African-American and Latinx participants. The multigroup factor analysis also determined model fit based on a one and two-factor structure fit for the PHQ-9.

CHAPTER IV

RESULTS

The purpose of this study was to analyze the psychometric properties of the PHQ-9 for African American and Latinx participants from the South Texas Brazos Valley Regional Health Status Assessment. In this study, Confirmatory Factor Analysis (CFA) was used to analyze the data and explore latent variable factor structure across ethnicity. Tests of reliability and validity of the PHQ-9 were conducted. The following research questions were addressed in this study:

1. What is the factor structure (one or two) of the PHQ-9 among African American and Latinx participants?
2. To what degree is the PHQ-9 measurement invariant for ethnicity among African American and Latinx respondents?
3. What is the item discrimination of the PHQ-9 among African American and Latinx respondents in relation to White respondents?
4. What are the differences in responses to the PHQ-9 among the African American and Latinx participants?

Descriptive Statistics

Participants of this study included residents of seven rural counties that comprise the Brazos Valley who received a survey conducted by the Texas A&M University Center for Community Health Development. Approximately 3,500 individuals responded to the Regional Health Status Assessment (RHSA). Respondents identified as White, African American, Latinx, Asian or Pacific Islander, and Native American;

however, this study will only use complete PHQ-9 data from individuals that identified as White (n=2,627), African American (n=302), and Latinx (n=329). Across ethnicity, the majority of participants are female (African American 75%, Latinx 75%, White 70%). Among African American and White participants, most are 45 years old or older (African American and White 80%). Among Latinx participants, most are aged 18 to 64 (83%). The average income for African American, Latinx and White participants are $34,933, $39,392, and $59,071 respectively.

Due to missing data, the total sample decreased by 244 participants, for a total of 3,258. Only participants with complete PHQ-9 data were included in the study sample. Incomplete PHQ-9 responses could not be utilized because it would skew data results. Replacing missing data with a mean average of responses or treating a response as zero would alter total scores and provide inaccurate results. Among the 46 African American participants with missing PHQ-9 data, most identified as female (80%), almost all were 35 years old and older (96%), with an average income of $20,493. Among the 37 Latinx participants with missing PHQ-9 data, most identified as female (70%), most were 35 years old and older (76%), with an average income of $22,539. Among the 161 White participants with missing PHQ-9 data, most identified as female (75%), most were 45 years old or older (85%), with an average income of $39,556.

Factor Structure of the PHQ-9

In this study, five different one-, two-, and three-factor structure models of the PHQ-9 were assessed among African-American and Latinx participants. The one- and two-factor structure models assessed were derived from previous studies of factor

structure of the PHQ-9 by Patel and colleagues (2019). An exploratory factor analysis (EFA) was utilized on the current data set to determine the proposed factor structure model. EFA results indicate a one-factor structure model. Tests of model fit were conducted in AMOS. The following fit indices indicate good model fit, chi-square with accompanying degrees of freedom (χ^2 is low compared to CMIN/df 1.0 to 5.0 indicates good fit), Comparative Fit Index (CFI; CFI ≥.95 indicates good fit), and the Root Mean Square Error of Approximation (RMSEA; RMSEA<.06) (Hooper, Coughlan & Mullen, 2008). Based on the tests of model fit, the one-factor structure model did not meet the requirements for good fit for African American and Latinx participants. The one-factor structure model was near adequate fit among African American participants, however ultimately did not meet model fit requirements with a χ^2 of 129.27 (p = .000 indicates lack of good fit), a CMIN/df of 4.79 (1 to 5 indicates good fit), CFI is below adequate at .91 (.92 - .94 indicates adequate), and RMSEA is below acceptable at .10 (<.08 indicates acceptable). The one-factor structure model was near adequate fit among Latinx participants, however did not meet model fit requirements with a χ^2 of 106.68 (p = .000 indicates lack of good fit), a CMIN/df of 3.95 (1 to 5 indicates good fit), CFI is adequate at .93 (.92 - .94 indicates adequate), and RMSEA is below acceptable at .09 (<.08 indicates acceptable). Two-factor structure models from previous studies were tested for model fit, however did not meet the requirements for good fit.

A three-factor structure model was determined from identified factor loadings. Based on the tests of model fit, the three-factor structure model met the requirements for good model fit for both African American and Latinx participants. The three-factor

structure model (Model 4) for African American participants has good model fit with a χ^2 of 97.17 (p = .000 indicates lack of good fit), a CMIN/df of 4.05 (1 to 5 indicates good fit), CFI is adequate at .94 (.92 - .94 indicates adequate, >.95 indicates good fit), and RMSEA is near acceptable at .09 (<.08 indicates acceptable, <.06 indicates good fit). The three-factor structure model for Latinx participants is a good model fit with a χ^2 of 84.81 (p = .000 indicates lack of good fit), a CMIN/df of 3.53 (1 to 5 indicates good fit), CFI is .95 (.92 - .94 indicates adequate, >.95 indicates good fit), and RMSEA is acceptable at .08 (<.08 indicates acceptable, <.06 indicates good fit). Descriptions of the two- and three-factor structure models that were tested are presented in Table 1 – Tested Factor Structure Models.

Table 1

Tested Factor Structure Models

PHQ-9 Item	Model 1	Model 2	Model 3	Model 4	Model 5
1 - anhedonia	non-somatic	non-somatic	non-somatic	non-somatic	somatic
2 - depressed	non-somatic	non-somatic	non-somatic	suicidality	non-somatic
3 - sleep	somatic	somatic	somatic	somatic	somatic
4 - fatigue	somatic	somatic	somatic	somatic	somatic
5 - appetite	somatic	somatic	somatic	somatic	somatic
6 - self-esteem	non-somatic	non-somatic	non-somatic	non-somatic	non-somatic
7 - concentration	non-somatic	non-somatic	somatic	non-somatic	somatic
8 - psychomotor	non-somatic	somatic	somatic	somatic	somatic
9 - suicide	non-somatic	non-somatic	non-somatic	suicidality	non-somatic

Although the initial EFA test suggests a one-factor model, CFA goodness of fit analysis results do not confirm model fit, yet indicates fit for the three-factor structure model (Model 4) among African American and Latinx participants. The model fit is at the threshold of adequate to good fit. Results for the tested factor structure models are presented in Table 2 – Factor Structure Model Testing Results.

Table 2

Factor Structure Model Testing Results

Factor Model	χ^2	CMIN CMIN/DF	P	Baseline Comparison CFI > .95 .92-.94 adequate	RMSEA RMSEA <.06 good <.08 acceptable
1 Factor – African American	129.27	4.788	.000	.914	.104
Model 1 – African American	316.68	11.729	.000	.757	.176
Model 2 – African American	364.93	13.516	.000	.716	.190
Model 3 – African American	336.63	12.468	.000	.740	.182
Model 4 – African American	97.17	4.049	.000	.939	.094
Model 5 – African American	375.25	13.898	.000	.707	.193
1 Factor – Latinx	106.68	3.951	.000	.932	.090
Model 1 – Latinx	261.98	9.703	.000	.799	.154
Model 2 – Latinx	325.79	12.066	.000	.744	.174
Model 3 – Latinx	370.86	13.735	.000	.706	.187
Model 4 – Latinx	84.813	3.534	.000	.948	.083
Model 5 – Latinx	379.83	14.068	.000	.698	.189

Measurement Invariance

Measurement invariance determines if scoring differences across groups could be attributed to group differences on the latent variable. Confirmatory Factor Analysis (CFA) tests both measurement invariance across groups (Merz, Malcarne, Roesch & Riley, 2011). Using AMOS, a multigroup confirmatory factor analysis of the three-factor model (Model 4) was assessed to determine if the PHQ-9 is measurement invariant for ethnicity among study participants. Three tests of measurement invariance were conducted, configural, metric and scalar invariance. Due to the lack of fit for the EFA proposed one-factor structure model, it was not utilized to test for measurement invariance and because of its good fit, the three-factor structure model (Model 4) was utilized. Tests of measurement invariance – configural, metric, and scalar invariance reflected a lack of measurement invariance across ethnicity ($p = .000$). As a result, when assessing problematic factor loadings in the model through critical ratio differences between model parameters, 26 factor loadings were identified. The most stringent factor loadings were related to psychomotor disturbance across African American and Latinx groups, suicidality across African American and Latinx groups, and anhedonia across Latinx and White groups. Although the CFI (.94) and RMSEA (.06) reflect possible configural invariance, TLI (.90) and CMIN (12.51) do not indicate measurement invariance across ethnicity among study participants. The same is true for tests of metric (CFI=.94, RMSEA=.05, TLI=.90 CMIN/df=11.16) and scalar invariance (CFI=.94, RMSEA=.05, TLI=.91, CMIN/df=9.93).

Tests of measurement invariance indicate a lack of measurement invariance in the PHQ-9 across ethnicity among study participants. These results do not support previous research of the PHQ-9. The results suggest that depression may not be assessed in the same way across ethnicity, and that items related to psychomotor disturbance, suicidality and anhedonia specifically should be assessed further in other community-based samples.

Internal Consistency and Item Discrimination

The purpose of item discrimination is to determine if an item in an assessment tests what it is intended to test, ultimately leading to internal consistency. In this study, the item discrimination of the PHQ-9 was assessed across ethnicity to examine the item functioning among African American, Latinx, and White participants. Internal consistency was determined utilizing reliability analysis and Cronbach's α in SPSS. A good level of internal consistency is $\alpha \geq .70$. Cronbach's α for all participants is .881, African American $\alpha = .877$, Latinx $\alpha = .870$, and White $\alpha = .882$, reflecting internal consistency across ethnicity. These internal consistency results support previous study findings of African American and Latinx samples (Huang et al., 2006; Keum et al., 2018; Merz et al., 2011).

Item discrimination was assessed utilizing discriminant analysis in SPSS. Overall, strong item discrimination is determined by Wilks' Lambda ($p < .05$ indicates strong item discrimination), Standardized Canonical Discriminant Function Coefficients (high values indicate strong predictor of depression), Corrected Item Total Correlation (above .30 indicates item reflects what the scale measures as a whole) and Classification

(high percentage indicates accuracy of item endorsement leading to identification of depression or not). Standardized Canonical Discriminant Function Coefficients is determined by the correlation between item endorsement and meeting the depression score cut-off. Depression status was determined by a PHQ-9 total score of ten or higher, indicating moderate to severe depression.

Based on the tests of item discrimination, the PHQ-9 appears to have strong item discrimination across ethnicity among this sample. Statistical significance was reached across all ethnic groups for Wilk's Lambda (sig. = .000). Among African American participants, items related to depressed mood (item 2 at .67), sleep disturbance (item 3 at .53), appetite change (item 5 at .48), fatigue (item 4 at .48), anhedonia (item 1 at .48) and low self-esteem (item 6 at .47) had the highest prediction of an overall result of depression based on the PHQ-9. The Standardized Canonical Discriminant Function Coefficients Structure Matrix is presented in Table 3.

Among Latinx participants, items related to depressed mood (item 2 at .71), anhedonia (item 1 at .63), low self-esteem (item 6 at .55), fatigue (item 4 at .55), sleep disturbance (item 3 at .52), concentration problems (item 7 at .48), psychomotor disturbance (item 8 at .48) had the highest prediction of an overall result of depression based on the PHQ-9. Among White participants, items related to depressed mood (item 2 at .69), anhedonia (item 1 at .67), low self-esteem (item 6 at .67), concentration problems (item 7 at .59), appetite change (item 5 at .51), fatigue (item 4 at .48), and sleep disturbance (item 3 at .46) had the highest prediction of an overall result of

depression based on the PHQ-9. The Standardized Canonical Discriminant Function Coefficients Structure Matrix is presented in Table 3.

Table 3

The Standardized Canonical Discriminant Function Coefficients Structure Matrix

PHQ-9 Item	African American	Latinx	White
1 anhedonia	.48	.63	.67
2 depressed mood	.67	.71	.69
3 sleep disturbance	.53	.52	.46
4 fatigue	.48	.55	.48
5 appetite changes	.48	.42	.51
6 low self-esteem	.47	.55	.67
7 concentration problems	.40	.48	.59
8 psychomotor disturbance	.33	.48	.41
9 suicidal ideation	.18	.35	.31

All items across ethnicities sufficiently reflect the PHQ-9 measures depression. At a cut-off of .30, suicide ideation (item 9 at .28) is on the cusp of item discrimination, while all other items across ethnicity are clearly above the cut-off. The Corrected Item Total Correlation is presented in Table 4.

Table 4

Corrected Item Total Correlation

PHQ-9 Item	African American	Latinx	White
1 anhedonia	.68	.66	.75
2 depressed mood	.77	.79	.77
3 sleep disturbance	.69	.59	.60
4 fatigue	.69	.67	.68
5 appetite changes	.67	.59	.65
6 low self-esteem	.66	.70	.72
7 concentration problems	.60	.56	.67
8 psychomotor disturbance	.52	.59	.52
9 suicidal ideation	.28	.42	.46

Classification results for all ethnicities indicate that items on the PHQ-9 are accurate in their predictor of an overall depressed or "not depressed" outcome. Among African American participants, a result of "not depressed" was accurately predicted at a rate of 100%, while a result of depression was accurately predicted at a rate of 95%. Among Latinx participants, a result of "not depressed" was accurately predicted at a rate of 99%, while a result of depression was accurately predicted at a rate of 78%. Among White participants, a result of "not depressed" was accurately predicted at a rate of 99%, while depression was accurately predicted at a rate of 85%. Classification of Group Membership results are presented in Table 5.

Table 5

Classification of Group Membership

	Predicted Group Membership	
Ethnic Group	Not depressed	Depressed
	%	%
African American	100	95
Latinx	99	78
White	99	85

Note: Depressed is determined by a PHQ-9 cut-off score of ten or higher.

Depression status was determined by a PHQ-9 total score of ten or higher, indicating moderate to severe depression. Rates of depression were highest among African American participants at 20%, White participants at 10%, and Latinx participants at 2%. Rates of Depression by Ethnicity are presented in Table 6.

Table 6

Rates of Depression by Ethnicity

Ethnic Group	*N*	%
African American	61	20
Latinx	37	2
White	258	10

Note: Depression is determined by a PHQ-9 cut-off score of ten or higher.

PHQ-9 Responses

Utilizing descriptive statistics, the frequency of endorsement for somatic related items were assessed. Based on previous research, it was hypothesized that African American and Latinx participants would have higher endorsement of somatic related items of the PHQ-9. Actual results did not support this assumption: African American and Latinx respondents did not have higher rates of endorsement of somatic related items than White respondents. The somatic symptoms were the most endorsed items across the three separate groups. Item endorsement is identified as the selection of "several days," "more than half the days," or "nearly every day."

Somatic related items in the PHQ-9 are identified as sleep disturbance, fatigue, and appetite changes. Sleep disturbance was endorsed by 49.9% of White respondents, 50.2% of African American respondents, and 44.2% of Latinx respondents. Fatigue was endorsed by 62.2% of White respondents, 66.6% of African American respondents, and 68.4% of Latinx respondents. Appetite change was endorsed by 33.8% of White respondents, 42% of African-American respondents, and 38.1% of Latinx respondents. The most endorsed items for White respondents were fatigue (62.2%), sleep disturbance (49.9%), and appetite changes (33.8%). The most endorsed items for African-American

respondents were fatigue (66.6%), sleep disturbance (50.2%), anhedonia (43%), appetite changes (42%), and depressed mood (37.9%). The most endorsed items for Latinx respondents were fatigue (58.4%), sleep disturbance (44.2%), appetite changes (38.1%), anhedonia (35.4%), and depressed mood (33.3%). Suicide ideation was the least endorsed item for all ethnicities (3.6% White, 5.4% African-American, and 5% Latinx). African-American respondents endorsed psychomotor disturbance (19.1%), low self-esteem (31.4%), and depressed mood (37.9%) at greater rates than White and Latinx respondents. The PHQ-9 Item Response Frequency Rates are presented in Table 7.

Table 7

PHQ-9 Item Response Frequency Rates

PHQ-9 Item	White %	African-American %	Latinx %
1 anhedonia	29.4	43	35.4
2 depressed mood	27.3	37.9	33.3
3 sleep disturbance	49.9	50.2	44.2
4 fatigue	62.2	66.6	58.4
5 appetite changes	33.8	42	38.1
6 low self-esteem	19.6	31.4	24.4
7 concentration problems	17	25.3	18.2
8 psychomotor disturbance	8	19.1	9.4
9 suicidal ideation	3.6	5.4	5

Study Findings

- The PHQ-9 has a three-factor structure model for African American and Latinx participants.
- The PHQ-9 is not measurement invariant across ethnicity in this study sample.
- The PHQ-9 has strong internal consistency and item discrimination across ethnicity.

- Somatic related items were most frequently endorsed by all ethnic groups, not exclusive to African American and Latinx participants. African Americans endorsed psychomotor disturbance, low self-esteem and depressed mood at greater rates than Latinx and White participants.
- The PHQ-9 is an overall useful instrument within the Health Assessment, however measurement invariance may indicate bias across ethnicity.

CHAPTER V

CONCLUSIONS

The objective of this study was to analyze various psychometric properties of the PHQ-9 for African American and Latinx participants in the South Texas Brazos Valley Regional Health Status Assessment. The recurrent nature of the Health Assessment in addition to the global severity and impact of depression, make this study valuable to the continued efforts and body of research for the PHQ-9. Study results identified a three-factor structure model of the PHQ-9 for African American and Latinx participants. Measurement invariance for the PHQ-9 was not statistically supported across ethnicity for study participants. The analysis confirms internal consistency and item discrimination of the PHQ-9 for study participants. The study demonstrates somatic symptoms of the PHQ-9 endorsed at the highest rates across ethnicity, not only African American and Latinx participants.

A three-factor structure model was identified as the best fitting model for African American and Latinx participants. The three identified factors include somatic symptoms, non-somatic symptoms, and suicidality. In the initial hypothesis, a three-factor structure model was not considered as a possibility, due to the lack of research regarding a three-factor structure of the PHQ-9. The model fit was not very strong, but the strongest among tested models still met the threshold of good fit. The exploratory factor analysis (EFA) recommended a one-factor structure model. However, the one-factor model did not meet tests of model fit. Indices fell below the threshold of adequate

or acceptable fit. The strength of model fit may increase with a larger sample and increased number of participants with depression.

Three-factor structure models of the PHQ-9 have not been widely reported in the literature. One study identified a three-factor structure model of the PHQ-9 as a model of good fit among a sample of pregnant women in Spain (Marcos-Nájera et al., 2018). It is recommended that future research explore a three-factor structure model of the PHQ-9 with various population groups. The factor structure has no direct impact or implications for this health survey. In light of the lack of fit for the EFA proposed one-factor structure model, it is recommended that the factor structure of the PHQ-9 be assessed in future surveys of this region. Additionally, the present study adds to the existing body of knowledge concerning the PHQ-9. Further study of the PHQ-9 in community health surveys could monitor any changes in its factor structure.

Contrary to the predicted hypothesis, the PHQ-9 utilized in the health survey reflected a lack of measurement invariance. A lack of measurement invariance suggests that depression is not measured in the same way across ethnicity. The lack of measurement invariance can be related to the factor structure model fit. The three-factor structure model was utilized, as it indicated the best model fit, albeit narrowly meeting the threshold of good model fit. It is recommended that measurement invariance continue to be assessed in future community health surveys. If a trend of lack of measurement invariance continues, the use of the PHQ-9 in surveys of this nature may need to be reassessed and an alternative measure of depression be utilized. It should be noted that the PHQ-9 is typically utilized in primary care and clinical settings. Because

the PHQ-9 is based on the nine symptoms and criteria for DSM-V depression, it has high specificity and in conjunction with a score of ten or higher cut-off specificity is maximized (Levis, Benedetti & Thombs, 2019). This suggests and supports the use of the PHQ-9 in primary care and community settings, with the use of a cut-off score of 10 or higher. The cut-off score captures potentially diagnosable levels of depression, however other important areas such as distress and anxiety within a sample may be unaccounted for and overlooked. Lastly, it is recommended that additional questions about general stress, distress, anxiety or worry be added to the Heath Assessment to provide additional context and understanding of participant's mental health.

The results indicate that the PHQ-9 has both strong item discrimination and internal consistency across ethnicity. The strong item discrimination and internal consistency suggests that the PHQ-9 tests what it is intended to test, depression. Item discrimination reveals the items that held the highest prediction of depression. For African American, Latinx, and White participants, depressed mood had the highest prediction of a PHQ-9 result of depression. For Latinx and White participants the next two items with the highest predictive value of depression were anhedonia and low self-esteem. In contrast, for African American participants the sleep disturbance and appetite change items had the second strongest predictive value. Further research on the item discrimination of the PHQ-9 across various ethnic groups and other populations (e.g., specific chronic illness, age groups, socio-economic status) could provide further insight into how depression is experienced among those groups, based upon how they endorse items on the PHQ-9. Endorsement patterns could potentially inform services for specific

groups in the community that may not readily disclose experiencing symptoms of depression. Item discrimination could be assessed in future community health surveys to track any changes or differences in the patterns observed in this study.

The PHQ-9 consists of items related to somatic and non-somatic symptoms of depression. In alignment with previous studies, among African American and Latinx participants, the most frequently endorsed items were somatic. But this pattern was also observed among White respondents. Fatigue and sleep disturbance were indicated most frequently respectively by all participants. Interestingly, psychometric disturbance was endorsed by African American participants at a rate two times that of Latinx and White participants. Given the non-clinical nature of the sample, it may not be surprising that the most frequently endorsed items across ethnicity were somatic – fatigue, sleep disturbance, and appetite changes.

Limitations of the Current Study

Limitations for this study are primarily related to the study sample. Self-report measures are inherently dependent upon the willingness of the respondent to accurately and fairly report their personal experience. The self-report nature of the PHQ-9 can result in underreporting of symptoms, and this tendency may be particularly pronounced in a non-clinical sample. Consequently, the results of the present study may not generalize to clinical settings in which depression may be frequently or reasonably expected.

Additionally, the sample size was primarily composed of White participants (80%); African American and Latinx participants each represented 10% of the sample.

This distribution is partly reflective of the Brazos Valley population: 77% White, 12% African American, 22% Latinx ("United State Census," n.d.). However, a larger and more balanced sample of African American and Latinx participants could provide a more robust sample and have an impact on the psychometric analyses. A larger sample size, for example, could alter the model fit, measure invariance, item response rate results, and potentially enhance internal consistency and item discrimination.

The Health Assessment identifies the Latinx group in this study as those that identify as "Hispanic or Latino." The identification of Hispanic or Latino ignores the participant's ethnic and cultural identity which can vary across country and region (i.e. Mexican American, Central American, Puerto Rican, etc.). Additionally, immigration status is not captured in the Health Assessment. The intersectionality of specific ethnic identity and citizenship status can have a direct impact on experiences and influences on depression. Identifying these important factors are critical to understanding the Latinx experience and contextualizing the Health Assessment results. It is recommended that the Health Assessment inquires captures ethnic background specifically as well as immigration status.

More robust psychometric results could occur in larger surveys, and these could also occur in large surveys across different regions. Larger surveys of a nation or state-wide sample that include the PHQ-9 could be examined to detect similar patterns in its psychometric properties that were observed in the present study. Studies of this nature could advance our understanding of the use of the PHQ-9 in community surveys, generally, and with non-clinical samples, specifically. These kinds of studies would

further our appreciation of the self-reporting of depression symptoms by race and ethnicity in community (i.e., non-clinical) samples.

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APPENDIX A

THE PATIENT HEALTH QUESTIONNAIRE – 9

The Patient Health Questionnaire -9 below is reprinted from Spitzer, Williams, Kroenke & colleagues (n.d.).

PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? *(Use "✔" to indicate your answer)*	**Not at all**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING 0 + _____ + _____ + _____

=Total Score: _____

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all	**Somewhat difficult**	**Very difficult**	**Extremely difficult**
☐	☐	☐	☐

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